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## UTAH CHILOPODS OF THE GEOPHILIDÆ.

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IN this paper are presented descriptive accounts of six new species of chilopods belonging to the genera *Geophilus* and *Linotænia*, four to the former and two to the latter. The material upon which the descriptions are based was collected for the most part during the spring and summer seasons of 1901. By way of showing the position of the new forms in their genera analytical keys are given for the species here first described and also those known previously from the western United States.

### KEY TO WESTERN SPECIES OF *GEOPHILUS*.

- a*<sub>1</sub>. Frontal plate discrete; last ventral plate wide.
  - b*<sub>1</sub>. Anal pores present; pleural pores numerous; pairs of legs 53-55 (♀); length 50-53 mm. . . . . *glaber* Bollman
  - b*<sub>2</sub>. Anal pores absent; pleural pores two; pairs of legs 47-53; length 37-47 mm. . . . . *cephalicus* Wood
- a*<sub>2</sub>. Frontal plate not discrete; anal pores present.
  - b*<sub>1</sub>. Last ventral plate relatively narrow.
    - c*<sub>1</sub>. Claw of anal legs obsolete; pleural pores ten or eleven; basal plate free; pairs of legs 73 (♂); length 39 mm. . . . . *occidentalis* Meinert
    - c*<sub>2</sub>. Claw of anal legs long; pleural pores eighteen or twenty; basal plate partly covered; pairs of legs 73-75; length 49-55 mm. . . . . *nealotus* sp. nov.
    - c*<sub>3</sub>. Claw of anal legs short or indistinct; pleural pores nine; pairs of legs 45-49; length 20-31 mm. . . . . *xenoporus* sp. nov.
    - c*<sub>4</sub>. Pleural pores thirty or more; basal plate partly covered; pairs of legs 64-67 (♀); length 36 mm. . . . . *californiensis* Bollman
  - b*<sub>2</sub>. Last ventral plate relatively wide.
    - c*<sub>1</sub>. Claw of anal legs obsolete; basal plate thrice wider than long; pleural pores partly covered; coxæ of prehensorial feet armed; length 29 mm. (♀) . . . . . *atopus* sp. nov.
    - c*<sub>2</sub>. Claw of anal legs short; basal plate four times wider than long; pleural pores free; coxæ of prehensorial feet unarmed; length 40-43 mm. . . . . *glyptus* sp. nov.

***Geophilus nealotus* sp. nov.**

*Description.* — Rather robust, very gradually attenuated anteriorly, more strongly posteriorly; prosternum and head with a few long hairs or subglabrous, the latter partly granular or mostly smooth, polished, the body nearly glabrous, smooth and polished; head light chestnut or brown, body dorsally light brown to yellow, ventral plates and legs yellowish, antennæ the same or darker.

Antennæ rather short (4.4–4.6 mm.); the four basal joints sparsely pilose with long hairs, the others closely clothed with finer short hairs; joints all long, the ultimate much shorter than the two preceding taken together.

Cephalic plate much longer than wide (5:3.8 nearly); posterior border truncate; impressed with two lateral and a single median sulcus, the latter within a more or less evident longitudinal furrow, which is wider and shallower anteriorly; covering the anterior border of the basal plate; basal plate large, subequal to the first dorsal scutum, 2.5 times wider than long.

Claws of prehensorial feet when closed reaching to the distal portion of the first antennal joint; each claw with a small obtuse tooth at base; coxa armed with an inconspicuous obtuse tooth; sternum wider than long, more than twice the outer height of the coxa, anterior border widely sinuate, unarmed.

Dorsal scuta with a single median and two lateral longitudinal sulci, which become obscure on a few of the first middle plates but are again distinctly impressed caudad; often a few of the last middle scuta with a transversely oval or oblong depressed and darker colored area marked off anteriorly and posteriorly by a crescentic impression; anterior præscuta very short, gradually increasing in size to the first posterior segments, which are moderate, then more rapidly decreasing to end of body.

Anterior spiracle very large, vertically oval or suboval, a few following of the same shape, others round; decreasing in size from the first to the last, caudad becoming very small.

Ventral scuta with a median longitudinal sulcus, which may be faint or quite absent on a number of the middle plates, its place there being taken by two more or less distinct lateral sulci; a median suboval or somewhat triangular poriferous area on posterior portion of each plate; with sometimes but one, but more commonly with two, transverse furrows, these on each side often broken up into several lines diverging toward the middle of the plate.

Legs sparsely pilose; first pair distinctly shorter and more slender than those following; anterior pairs stouter and shorter than posterior pairs; anal legs much longer than the penultimate, moderately swollen, each provided with a rather long claw.

Posterior pleuræ inflated, with 18–21 subseriate pores on each side, the few innermost covered by the last ventral plate; last ventral plate

relatively rather narrow, its sides very gently curved convexly (♀) or concavely (♂), converging posteriorly; anal pores moderately large.

Pairs of legs of male seventy-three, of female seventy-five. Length of male 55 mm., width 1.6 mm.; length of female 49 mm., width 1.5 mm.

*Adolescens*.—A specimen 30.5 mm. long measures .7 mm. in width; length of antennæ 2.6 mm.; pleural pores very small, eight on each side; pairs of legs the normal number (75); coloration as in adults.

*Habitat*.—Under stones in the gullies of the hillsides north of Salt Lake City.

The types were collected March 28, 1901.

#### *Geophilus xenoporus* sp. nov.

*Description*.—Moderately robust, distinctly attenuated caudad and cephalad; head and prehensorial feet sparsely pilose with long or moderately long hairs, cephalic plate punctate, especially at sides, with moderately coarse punctæ, the prosternum and coxæ of prehensorial feet sparsely minutely punctate, dorsal and ventral plates nearly glabrous, smooth or a little roughened; head and prehensorial feet with prosternum light brown, body, legs, and antennæ yellow.

Antennæ rather short (♂ 1.6–2 mm., ♀ 2.4–2.5 mm.); first seven or eight joints sparsely pilose, the others, especially the final ones, densely clothed with short straight hairs; articles all long, the ultimate subequal to the two preceding taken together.

Cephalic plate much longer than wide (7:5 nearly), narrowed posteriorly; posterior border somewhat rounded, covering the basal plate anteriorly; with two rather long lateral sulci and a brief but sharply impressed median line immediately caudad to the frontal suture; basal plate rather large, width about three times the middle length, the plate being more exposed laterally.

Claws of prehensorial feet when closed reaching or a little surpassing the distal end of the first antennal article; claw armed at base with a long subacute tooth; inner side of coxa long, armed similarly to claw but tooth somewhat stouter; prosternum nearly equal in length and breadth, less than twice the height of the coxa, the anterior border narrowly and acutely incised, unarmed.

Dorsal scuta bisulcate, the sulci distinct throughout; anterior præscuta short, the middle long or very long, the posterior moderate.

First spiracle longitudinally oval, the others circular, not much decreasing in size caudad, all small.

Ventral plates with a median sulcus which is deep, especially cephalad.

Legs sparsely pilose; the first pairs shorter and much more slender than those succeeding; the anterior pairs stouter than the posterior but not much differing in length; anal legs of male much swollen, those of the female more slender, with a short or indistinct claw in the male, longer in the female.

Pleuræ of last segment not much inflated, with about nine small pores on each side, these arranged along a suboval line on ventral and lateral surfaces; last ventral plate narrow, the sides straight and parallel; anal pores small.

Pairs of legs of male 45, of female 47-49. Length of male 19-21 mm., width .5-.6 mm.; length of female 30-31 mm., width .9-1 mm.

*Adolescens*.—Specimens 13 mm. long measure .4 mm. in width; length of antennæ 1.2 mm.; pleural pores four or five on each side; color pale yellow.

*Habitat*.—Canyons near Salt Lake City, mostly among decaying leaves and in vegetable mold.

The types were collected in City Creek Canyon, April 1, 1901.

#### *Geophilus atopus* sp. nov.

*Description*.—Rather slender, very gradually attenuated cephalad, more strongly caudad, depth of the body in the middle region as great as the width; head sparsely pilose, smooth, the basal plate and exposed dorsal portion of prosternum more densely covered with hair, the dorsal scuta mostly very sparsely clothed with short hairs, not at all roughened; cephalad light brown, head a little darker at sides, caudad yellowish, antennæ and legs concolorous with adjacent parts of body.

Antennæ short (2 mm.); the first three or four joints sparsely pilose with moderate straight hairs, the others more closely clothed with short hairs which increase in density to ultimate joint; ultimate article nearly equal in length to the two preceding taken together.

Cephalic plate much longer than wide (5:4 nearly); anterior and posterior margins truncate; with two distinct lateral sulci and a fine discontinuous median line; frontal border of basal plate concealed, exposed portion thrice wider than long.

Claws of the prehensorial feet when closed reaching to the middle of the first antennal article; claw armed at base with a pale obtuse tooth; coxa armed similarly to claw; prosternum wider than long (9:8 approximately), less than twice the height of the coxa, anterior margin with only a shallow sinus, unarmed.

Dorsal scuta with two rather faint lateral sulci and a single median sulcus, these more strongly impressed caudad; first dorsal præscuta short, irregularly increasing in length to the posterior region, where they are long excepting the last few, which are very short.

The first anterior spiracle subround, those following round, gradually decreasing in size caudad, finally becoming small or very small.

Ventral scuta faintly sulcate, the anterior ones with a median depressed area posteriorly on the plate; ventral pores large, arranged over and about the depressed area, extending forwards and backwards along the median line and laterally to the sides, farther caudad the pores mostly restricted to

a transverse band; posterior border of the anterior scuta produced backwards from the sides to the middle, there touching or slightly overlapping the succeeding plate, exposing the præscutum of the latter only at the sides; posterior borders of plates after the twenty-second straight.

Legs, excepting ultimate, pilose with moderately long straight hairs; first pair more slender than others, not much shorter; anterior pairs much stouter than the posterior, not much shorter; anal legs much swollen, claw obsolete, clothed more densely and, more often, with shorter hairs than pairs preceding.

Pleuræ of last segment not much inflated, with about twelve pores of several sizes, these arranged subseriately, partly covered by the last ventral plate; last ventral plate wide, much wider than long (1.85:1), sides convexly curved, converging posteriorly.

Pairs of legs of male 69. Length of male 29 mm., width .7 mm.

*Habitat.*—The type specimen, a male, was found buried in damp sawdust under a piece of timber, Salt Lake City.

The type was taken June 3, 1900.

#### *Geophilus glyptus* sp. nov.

*Description.*—Body robust, caudad strongly, cephalad but little attenuated; head pilose at sides, more especially posteriorly, basal plate and exposed dorsal portions of prosternum more densely pilose, prosternum ventrally subglabrous, first dorsal plates sparsely provided with short hairs, the plates caudad becoming subglabrous, ventral plates glabrous; head and prosternum with the prehensorial feet chestnut, body above and below amber brown, or in middle portions yellowish, legs and antennæ concolorous with the body.

Antennæ short (3–3.4 mm.), stout, attenuated from base distally; first four or five joints sparsely provided with long hairs, the others with shorter hairs, which decrease in length and increase in density toward ultimate article; articles long, the ultimate shorter than the two preceding taken together.

Cephalic plate a little longer than wide (9:8.2 nearly); posterior margin truncate, anterior margin extending forward from the sides to the middle, sides rounded, impressed with two lateral and a single median sulcus; basal plate partly covered, exposed portion over four times wider than long.

Claws of prehensorial feet not much curved, when closed reaching to or a little beyond the distal end of the first antennal article; each claw armed at base with a moderately small obtuse tooth; inner side of coxa short or very short, unarmed; prosternum wider than long (not quite 9:8), over twice the outer height of the coxa, anterior margin widely sinuate.

Dorsal scuta impressed with two lateral and a single deep median sulcus; anterior præscuta very short, middle long or very long, posterior short.

First two anterior spiracles very large, round, those following abruptly smaller, also round, gradually decreasing in size caudad, in the middle and posterior segments very small.

Ventral plates with a median sulcus which is strongly impressed cephalad, becoming rather faint caudad.

Legs all pilose; the first pair much smaller than those succeeding; anterior pairs much stouter and also longer than the posterior; anal legs long, moderately to strongly swollen, armed with a short or very short claw.

Last pleuræ moderately inflated, with about twelve pores which are subseriate and free, or sometimes a few covered by the last ventral plate; last ventral plate moderately wide (♂) or narrower (♀); anal pores present, moderate in size.

Pairs of legs of male 67, of female 69. Length of male 43 mm., width 1.3 mm.; length of female 40 mm., width 1.2 mm.

*Adolescens*.—Specimens 30 mm. long measure .8 mm. in width; proportionately wider cephalad than adult; length of antennæ 2.6 mm.; pleural pores seven or eight on each side; coloration nearly as in adults.

*Habitat*.—Along the streams in the canyons near Salt Lake City.

The types were collected in Neff's canyon, Salt Lake County, June 30, 1900, by my brother, Mr. Seth C. Chamberlin.

#### KEY TO WESTERN SPECIES OF LINOTÆNIA.

- a*<sub>1</sub>. Pairs of legs 71–81; individuals large.
  - b*<sub>1</sub>. Pairs of legs 71; length 60 mm., head not punctate or spotted.
    - parviceps* (Wood)
  - b*<sub>2</sub>. Pairs of legs 81; length 140 mm., head minutely spotted with white.
    - epileptica* (Wood)
- a*<sub>2</sub>. Pairs of legs 37–47; individuals small. (Frontal plate discrete, anal pores present, last ventral plate wide or moderate.)
  - b*<sub>1</sub>. Anal legs shorter than the penultimate; pleural pores 5–7, moderate; posterior border of cephalic plate straight; pairs of legs 39–41; length 13.5–16.7 mm. . . . . *miuropus* sp. nov.
  - b*<sub>2</sub>. Anal legs longer than the penultimate; pleural pores 7–11, small; posterior border of cephalic plate triangular; pairs of legs 43–47; length 20–21 mm. . . . . *micropus* sp. nov.

#### *Linotænia miuropus* sp. nov.

*Description*.—Robust, gradually attenuated caudad, more strongly cephalad; head and entire body moderately or subdensely clothed with short hairs, smooth; ferruginous, ventral plates and legs paler.

Antennæ short (maximum length 1.2 mm.); moderately hirsute, decreasing in density distally, ultimate article subglabrous, hairs short or very short; first articles of medium length, shorter distally, the ultimate longer than the two preceding taken together.

Cephalic plate wider than long; posterior border covered by the basal plate, substraight; impressed with a median sulcus; frontal plate discrete; basal plate in male less than thrice wider than long (2.8:1 nearly), in female more than four times wider (4.35:1).

Dorsal scuta not sulcate; anterior præscuta short, middle and posterior moderately long.

Ventral plates with a distinct median sulcus.

Spiracles all round, the first rather small, those succeeding scarcely decreasing in size, the posterior being not much or not at all smaller than the anterior.

Legs sparsely hirsute with moderately long hairs; first pair distinctly smaller than others; the anterior and posterior pairs subequal; anal legs of male shorter than the penultimate, much stouter, densely clothed with short hairs, armed with a slender claw, anal legs of female slender, not at all swollen, similarly hirsute to other legs.

Pleuræ of last segment with 5-7 moderate pores on each side; last ventral plate relatively intermediate in width, wider than long (6.7:5.7 nearly), sides curved, converging posteriorly; anal pores moderate.

Pairs of legs of male 37-39, of female 41. Length of average male 16.7 mm., width .9 mm.; length of female 13.5 mm., width .65 mm.

*Habitat.*—About a dozen specimens were found in Logan canyon, Cache county, near the mouth, and three were taken among the pines on the divide between Daniell's Creek and Hobbie Creek canyons, Utah county.

The types were collected May 25, 1901.

#### *Linotænia micropus* sp. nov.

*Description.*—Robust, cephalad strongly, caudad more gradually attenuated; head and body above and below pilose, more densely in female than in male, last ventral segments more densely pilose than others, prosternum nearly glabrous (♂) or sparsely hirsute (♀); ferruginous throughout.

Antennæ very short (1 mm.), stout; moderately pilose; articles mostly short, the ultimate longer than the two preceding taken together.

Cephalic plate as a whole subequal in width and length, exposed portion wider than long in the ratio of 6:5.4; posterior border produced backwards from sides to middle, subtriangular, overlapped by the basal plate; basal plate thrice wider than long.

Claws of prehensorial feet when closed not reaching the front margin of head by a considerable space; claw armed at base with a long stout tooth, coxa unarmed; prosternum much wider than long (7:4.2 approximately), two and one-half times longer than the coxa, anterior margin widely sinuate, unarmed; inner margin of coxa extremely short or entirely concealed.

Dorsal scuta not sulcate; anterior præscuta short, longer in male than in female, the middle and posterior moderately long.



Ventral plates with a single median sulcus which caudad becomes indistinct or obsolete, with a transverse furrow or depression; excepting the first few, with a rather large median poriferous area on the anterior portion of plate, this often, especially caudad, prolonged backwards in the form of a narrow tongue; ventral pores also arranged on each side of the sulcus in front of the posterior border.

Anterior spiracle intermediate in size, those succeeding very gradually decreasing, caudad becoming small.

Legs pilose with mostly rather long hairs; first pair distinctly reduced, the second pair intermediate; anterior and posterior pairs not much differing in size; anal legs of male strongly swollen, densely clothed with short to very short fine hairs, longer than the penultimate, anal legs of female not at all swollen, similarly pilose to other legs, armed with a short pale claw.

Pleurae of last segment with 7-11 small obliquely seriate pores on each side; last ventral plate wide, sides curved, strongly converging posteriorly, anterior border produced forwards from sides to middle line, making the plate subpentagonal; anal pores present.

Pairs of legs of male 43-47, of female 47. Length of average male 21 mm., width 1 mm.; length of female 20 mm., width 1.2 mm.

*Adolescents*.—Specimens 12.5-13.5 mm. long measure .4-.6 mm. in width; length of antennae .6-.7 mm.; pleural pores 4-6 on each side; color yellowish or light brown.

*Fetus*.—One individual examined is still coiled up within the egg, the yellowish outer membrane, or shell, of which, however, is evenly split down one side from end to end, the thin transparent inner membrane being still intact; in this condition the egg is spherical and measures 1 mm. in diameter.

An individual 4 mm. long is free excepting posterior segments, these still covered by the membranes; legs short and rather stumpy, closely crowded; antennae bent back under the head along the not yet fully formed mouth parts.

Specimens 4.5-7.5 mm. in length still spirally coiled; width .4 mm. and under; antennae extended, as usual relatively long, clavate, joints very short excepting the ultimate, the latter as long as the three or four preceding taken together; color brownish.

*Habitat*.—In the quaking aspen and pine woods along the head waters of Manti and Pole canyons, San Pete County, and about the glacial lakes at the head of Little Cottonwood canyon, Salt Lake County.

All the specimens of the fetus stage, ten in number, were found together with the body of the female coiled about them, the nest being a pit in the underside of a log.

The types were collected in Pole canyon, July 15, 1901.

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